



“Intervenor” in agonistic interactions amongst domesticated goats

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Receipt of Ms. 29. 01. 1997

Acceptance of Ms. 05. 03. 1998

Abstract

Social behaviour was observed in individually marked goats in two herds. The goats from one herd ($n = 98$) were horned, those of the other herd ($n = 83$) were polled. By recording agonistic interactions within the herds, a dominance index was determined for each animal. In both herds, intervention took place. Intervention is defined as one animal pushing in between two fighters, and thus ending the fight.

More cases of intervention took place per individual animal amongst the horned goats than amongst the polled ones. Goats which intervened in fights on several occasions usually had a high dominance index. Members of the herd which were observed intervening only once had an average dominance index in both herds of almost 0.5. In some cases, goats very low in the rank order intervened a fight. Only rarely did the intervenors have a lower dominance index than the two fighters.

In 103 cases, the direct dominance relationship between a fighting animal and the intervenor was known. In 95 cases (92.2%), the intervenor was dominant to the herd member in this fight and in just eight cases (7.8%), it was subordinate. It could not be determined what advantage the intervenor gained from its activity. It is possible that, at least in certain cases, a particularly relationship existed between the intervenor and one of the fighters.

Key words: Goat, intervention, behaviour, domestication, rank order

Introduction

Many studies of the social behaviour of farm animals are concerned with the social rank order. Usually these are about the underlying factors which affect rank, the development of fights and other aggressive behaviour (i.e. threatening), as well as the effects of the dominance order on the individual animal. It is less frequently noted that there are also “friendly” interactions within groups of farm animals. An example of this is social grooming, eg. social licking amongst cattle (SAMBRAUS 1969) and mutual nibbling amongst zebra (ANDERSEN 1992).

One particular phenomenon of social behaviour is intervention. Intervention is described as an additional animal breaking up or disturbing an interaction between two or more of its conspecifics. Such interactions can be fights, sexual contact or even friendly behaviour (e. g. social grooming).

Intervention has been observed above all in primates (SEYFARTH 1976; KUMMER 1975; SILK 1982) and equines (ZEEB 1958; KLINGEL 1967; FEIST and MCULLOUGH 1976; MATTIJS and SCHILDER 1990). But it also occurs in cattle (SAMBRAUS 1969) and rats (MILTZER 1995) and has even been described for fish (WALTER and TRILLMUCH 1994).

This study aims at investigating situations, in which intervention takes place, in two large herds, one of horned and one of polled goats. Thus only small details of the term known in the broader sense as intervention, were recorded. The examination has been reduced to a large extent to the following areas: a) to determine the dominance index of the fighting animals and that of the intervening goat and b) to check what rank relationship those animals who were involved in the intervention, had to each other.

Material and methods

The observations were carried out on a farm in Bavaria. The total number of livestock was 800 goats, up to an age of twelve years. Originally kept were the breeds Coloured German Improved, White German Improved, Toggenburg, Saanen, and Anglo-Nubian goats. As the unit was concerned purely with milk yield, no value was put on retaining purebred stock. At the time of the observations, the animals were almost at the same stage of lactation. For the examination in hand, one group of horned and one of polled goats was chosen.

The group of horned goats contained 98 animals. This herd was put together about two weeks before the beginning of the observation period (end of February). The group of polled goats with 83 animals was formed more than two months before the beginning of the observation period. All animals were provided with plastic neck collars for individual identification.

The goats were kept in pens in an insulated, unheated building with ventilation through the eaves. The pens were 33.0 m long and 4.2 m wide (polled group), or 4.8 m wide (horned group). The floor space was therefore 1.7 m²/animal in the polled group and 1.6 m²/animal in the horned group.

Each pen was divided into halves, lengthwise; the lower resting area was straw bedded. Two steps led on to the feeding area 1 m higher up. The feeding area gave access to the feeding trough. Since the trough covered the whole length of the pen, all animals had access to it at the same time. The feeding of the two groups varied according to the different seasons at the time of the observations. For the horned goats (observation time was the end of February to the beginning of May), the feeding ration consisted of grass pellets, corn pellets, and hay ad lib. Feeding took place once a day, in the late morning. The polled group (observation time was the beginning of May to the end of June) received corn pellets as well as forage, twice a day, ad lib. (in the late morning and late afternoon).

Direct observations took place each week on three consecutive days. Between 07.15 hours and 18.00 hours there were four observation blocks with a total of eight hours. The observations were carried out from the long side of the pen. The results were written down by hand. All instances were recorded in which a goat interrupted an interaction between two others; in addition to this, behaviour displaying dominance, such as fights, the displacement of animals from the resting area, feeding or drinking troughs and avoidance or freezing of the threatened member of the herd.

At the close of the observation period, a dominance index was calculated for each goat. This was done by taking the number of animals over which an individual had shown itself to be dominant, and dividing it by the number of herd members for which a dominance relationship could be clarified. If, for example, 42 dominance relationships could be clarified for one animal and it proved itself to be superior to 27 herd members, then it received an index of $27 : 42 = 0.64$. The rank index lies always between 0.0 and 1.0. Corrections as in SAMBRAUS and OSTERKORN (1974) or transformations to arcsin (BEILHARZ and ZEEB 1982) were not carried out.

Occasionally, when two herd members fought vigorously and lengthily with each other, a third one came and pushed in between the two fighters. This happened in a way, almost without exception, which was non-aggressive, very peaceful but forceful. With this, the opponents stopped the fight. Sometimes, however, several attempts at intervention were necessary, occasionally from several different intervenors in order to settle a conflict. Several attempts at intervention from one goat, on the one occasion, were however recorded as just one intervention. One particular goat made itself noticeable by getting up from distant resting places to put an end to fights.

For the horned goats, the length of the observation period was 25 days, for the polled goats, 20 days. The duration of the observation time each day was the same for both herds.

Results

One requirement for the interpretation of intervention was the recording of the social rank order of both herds. In principal, in a herd with n animals, $n(n-1):2$ rank relationships exist. In the herd with the 98 horned goats there were 4753 different pairs. For the observation period, 3083 situations demonstrating dominance behaviour were registered. From these, 1980 cases of dominance relationships (41.7% of all possible relationships) could be clarified.

In the group of 83 polled goats, the total number of possible dominance relationships was 3403. During the observation period, 2304 cases demonstrating dominance-behaviour were seen. From there 1489 dominance relationships (43.8% of all dominance relationships occurring in this herd) were clarified.

For the horned animals 66 interventions were observed during this period of time; for the polled goats, 15. In order to make the figures comparable, corrections had to be made to allow for the varying number of animals in the herds and the length of the observation time. When expressed per to 10 animals and 100 hours of observation, 3.37 interventions occurred amongst the horned goats, and 1.13 amongst the polled goats (Tab. 1).

Table 1. Details on „Intervention“ in one herd of horned and one of polled dairy goats

	herd	
	horned	polled
Number of animals	98	83
Days of observation	25	20
Total number of interventions	66	15
Number of interventions per 10 animals and 100 hours of observation	3.37	1.13
Average difference in dominance index between the two fighters	0.186	0.083
Average dominance index of the intervening goats	0.639	0.511
Number of interventions in the following dominance situation:		
– Intervenor has higher dominance index than both fighters	54	13
– Intervenor has higher dominance index than one of the two fighters	8	0
– Intervenor has lower dominance index than both fighters	4	2

The average difference between the dominance indices of the two opponents was 0.186 for the horned goats and 0.083 for the polled animals. It was, therefore, very small. In both herds, the intervenor usually had a higher dominance index than the two fighters. However, in the herd of horned animals there were intervenors whose dominance index lay somewhere between those of the two fighters. There were some animals both in the horned group as well as in the polled group, whose dominance index was less than those of the two goats involved in the aggressive situation.

The mean dominance index of the intervening goats lay on average at 0.639 (0.200–0.988) for the horned goats, for the polled goats at 0.511 (0.133–0.938). The intervenors were therefore not necessarily high ranking animals; amongst them were also low ranking animals. There were, however, amongst the horned as well as amongst the polled animals some goats, which intervened only once during the observation period. They had a mean dominance index of 0.539 (Tab. 2). On the other hand, within the herd of horned goats there were fourteen animals which intervened on several occasions (2–8 times). They had a mean dominance index of 0.800, i.e. were generally of high rank. Within the herd of polled goats, there was only one animal which intervened in a fight on several occasions (3 times). This goat also had a high dominance index (0.816).

Table 2. Dominance index of one-off and multiple intervenors in the herds of horned and polled goats

	horned	polled
Number of intervenors, which intervened more than once	14	1
Frequency of the multiple interventions	2 to 8 times	3 times
Number of interventions through multiple intervenors	44	3
Average dominance index of multiple intervenors	0.800	0.816
Number of interventions by one-off intervenors	22	12
Average dominance index of one-off intervenors	0.539	0.486
Lowest dominance index of an Intervening goat	0.286	0.133

The dominance index reveals whether an intervenor has a high or a low position in the rank order. Because the social rank order is not linear, it does not reveal the dominance relationship existing between the intervenor and the two fighting animals. Hence, it was tested whether the intervenor was dominant or subordinate to the two fighters, as far as this was clear, during that particular clash.

In all, 81 cases of intervention were recorded (66 amongst the horned goats, 15 for the polled animals). As two fighting herd members were involved in each situation, the intervenors could have a fixed dominance relationship with 162 animals in total (Tab. 3). Because only just over 40% of all possible dominance relationships could be clarified in both herds, quite a lot of dominance relationships between fighters and intervenors remained unknown.

Table 3. Direct dominance relationships clarified between intervenors and fighters

	horned	polled	total
Number of interventions	66	15	81
Number of fighting animals taking part in the interventions	132	30	162
clarified dominance relationships between fighters and intervenors	87	16	103
from these the intervenor was dominant to ... fighters	80	15	95
from these the intervenor was subordinate to ... fighters	7	1	8
Interventions, in which the relationship of the intervenor to both fighters was clarified	31	5	36
Intervenor was dominant to both fighters	26	5	31
Intervenor was subordinate to one of the fighters	4	0	4
Intervenor was subordinate to both of the fighters	1	0	1

In total, the direct dominance relationship between one of the fighters and the intervenor could be clarified 103 times (63.6%). Out of these interactions the intervenor was dominant to one of the herd members taking part in the fight in 95 cases (92.2%), it was subordinate in only 8 cases (7.8%).

The dominance relationships of the intervenor to both fighters were known for 36 of the 81 intervened fights (44.4%). In 31 of these situations, the intervenor was dominant to both members of the herd involved in the fight (86.1%). In four cases, all within the herd of horned goats, the intervenor was subordinate to one of the fighters (11.1%), and, in one case, again within the horned group, the intervenor was subordinate to both fighters.

There were five goats who intervened in at least four fights during the observation period. All were horned, and therefore belonged to the herd with 98 individuals. One of these five goats was no. 14. She intervened five times. The herd member no. 37 took part in three of the fights. Goat no. 51 intervened in seven of the fights. The herd member no. 52 took part in three of these fights. Goat no. 54 was observed intervening four times. Once more the herd member no. 37 was involved here three times in a fight. Four fights were interrupted by no. 67, and in two of these no. 16 was involved. Only in the four fights interrupted by goat no. 84, did those involved change constantly.

Discussion

The term "intervention" means that one individual wants to influence the outcome of an interaction between group members (MATTIJS and SCHILDER 1990). For example an intervenor may drive away rivals from females in heat (SAMBRAUS 1973) or remove a certain group member, which is groomed by another, in order to take its place (SAMBRAUS 1969).

Social behaviour is thought to be an expression on the controlling processes, so that an animal tries to bring an existing social situation in line with its idea of it. WIEPKEMA and VAN HOOFF (1977) define this set point, which tells how a situation has to be, the norm value. It is possible that the purpose of the interventions we observed was to obtain a peaceful state. However, it is not clear what advantage the intervenor derives from such actions.

The observed interventions occur as well in wild ungulates, for example Scimitar-horned oryx (*Oryx dammah*) (ENGEL 1997) and Fringe-eared oryx (*Oryx gazella callotis*) (FEUERRIEGEL 1997), the latter only referring to alpha males. The behaviour of interventions is not caused by the process of domestication and it is more likely to be seen in wild than in domesticated animals. Aggressive behaviour for example is shown in many domesticated species to a lesser degree than in the wild (HERRE and RÖHRS 1990).

Fighting animals are in danger of becoming injured. Necessarily their attention is fixed to each other and this leads to a decreased ability to look out for their predators and an increased risk to fall a prey. It is possible that the behaviour of interventions has a selective value for the purpose of species preservation.

But applying the above interpretation to a rather contrary behaviour leads to problems: Sometimes several herd members get aggressive when stimulated by two fighting animals, so that a so-called fighting-storm grows out of it. It is unlikely that big mammals like buffalo run a risk of being captured by predators while taking part in such a fighting-storm. However fighting-storms have also been observed in ibex (WALTHER 1960/61), a species that is indeed exposed to danger of being killed by predators.

Interventions seem to appear in wild animals mostly if the vehemence of a fight goes beyond a certain degree (ENGEL 1997; FEUERRIEGEL 1997). Both groups of goats in this study intervened more if a fight exceeded a certain length of time.

Generally changes in behaviour resulting from domestication are a way of adapting to ecological conditions of housing (HERRE and RÖHRS 1990). Interventions happened much more often in the horned than in the polled group, even after adjusting for differing length of observation and number of animals. A possible explanation is that fights between horned individuals are more harmful than between polled goats. But it is not likely that these differences in the quantity of appearance of this behaviour are based genetically because all of the animals, the horned and the hornless, came out of one genpool.

It should be noted that the function of intervening was not only the right to one particular member of the herd. It must be emphasized, that there was an absolute alpha animal only in one of the two herds, in the polled group, which, measured on the scale of rank relationships already clarified, had a dominance index of 1.0 (KEIL and SAMBRAUS 1996). Amongst the horned group, goat no. 83 had the highest dominance index at 0.988.

Superior to her was goat no. 57 (three observations), but in turn eight members of the herd were superior to her, thus she had a dominance index of just 0.842 (KEIL and SAMBRAUS 1996). However, a highly ranked herd member has a special function during intervening. This still does not rule out the possibility that in isolated cases, members of the herd which have a position in the lower half of the rank order could also intervene in a fight.

In principal, animals with a low dominance index can also intervene in a fight. This conclusion becomes relative, however, when the actual dominance relationship of the intervenor to the fighters, is examined. Almost in all cases, the intervenor is dominant to both fighters. The function of the intervenor is obviously linked to a certain amount of authority. Thus, the exceptions are even more remarkable, when the intervenor is subordinate to one or both opponents.

Agonistic behaviour serves to re-establish a particular target value in social behaviour (WIEPKEMA and VAN HOOFF 1977; WIEPKEMA et al. 1980). MATTHIJS and SCHILDER (1990) verify that this, in the same way, is valid for intervention. It is imaginable, that through intervention, a certain target value can also be re-established. In this study this question was not examined systematically. It is possible that the intervenor had a friendly relationship with one of the two fighters, as has been observed amongst cattle (SAMBRAUS 1976). Goats in general demonstrate a very diverse type of social behaviour. Intervention, which has never before been described in this form occurring amongst other farm animals, confirms this.

Behaviour during intervention, and the course it takes, should be clearly distinguished from coalition, also observed amongst the animals. In this case, the goat approaching the two fighters clearly attacks one of the opponents and supports her actively, thus showing aggressive behaviour. A further form in which the animals react to fights amongst members of the herd, is the emergence of group fights. During these, more and more animals take part in a clash, the opponents changing frequently and new coalitions being built up, without there being a recognisable outcome of the individual fights. Here the opposite of intervening behaviour is accomplished through the intervention of the animals, namely they succeed in unsettling a large part of the herd.

Acknowledgements

The authors thank A. GRUBER for great support of the observations on his farm, Ms I. Mc'INTYRE for her assistance in handling the animals, and to her as well as H. ERHARD for translating the manuscript.

Zusammenfassung

„Schlichter“ bei sozialen Auseinandersetzungen von Hausziegen

Es wurden Beobachtungen zum Sozialverhalten von individuell gekennzeichneten Geißen in zwei Ziegenherden durchgeführt. Die Geißen der einen Herde ($n = 98$) waren gehörnt; die der anderen Herde ($n = 83$) waren hornlos. Für jedes Tier wurde aus zahlreichen Auseinandersetzungen mit Herdenmitgliedern ein Dominanzindex bestimmt. In beiden Herden kamen „Schlichtungen“ vor. Das bedeutet, daß ein Tier sich zwischen zwei hartnäckig kämpfende Herdenmitglieder drängte und damit den Kampf beendete.

Bei den gehörnten Geißen kamen, bezogen auf das Einzeltier, mehr Schlichtungen vor als bei den hornlosen. Geißen, die mehrfach Kämpfe schlichteten, hatten gewöhnlich einen hohen Dominanzindex. Herdenmitglieder, die nur einmal als Schlichtende beobachtet wurden, hatten in beiden Herden einen durchschnittlichen Dominanzindex von nahezu 0,5. In einigen Fällen schlichteten sehr rangtiefe Geißen einen Kampf. Nur selten hatten Schlichtende einen niedrigeren Dominanzindex als beide Kämpfenden.

In 103 Fällen war das direkte Dominanzverhältnis zwischen einem kämpfenden Tier und der Schlichterin bekannt. In 95 Fällen (92,2%) war die Schlichterin diesem am Kampf teilnehmenden Herdenmitglied im Rang überlegen, nur in acht Fällen (7,8%) war sie ihm unterlegen. Es konnte nicht geklärt werden, welchen Vorteil die Schlichterin von ihrer Aktivität hat. Möglicherweise besteht zumindest in gewissen Fällen zwischen Schlichterin und einer der Kämpfenden ein besonders intensives Verhältnis.

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